CLAIMS:

1. A method of controlling a process performed by a semiconductor processing tool, comprising:

inputting data relating to a process performed by the semiconductor processing tool;

inputting a first principles physical model relating to the semiconductor processing tool;

performing first principles simulation using the input data and the physical model to provide a first principles simulation result;

using the first principles simulation result to build an empirical model; and

selecting at least one of the first principles simulation result and the empirical model to control the process performed by the semiconductor processing tool.

2. The method of Claim 1, wherein said inputting comprises directly inputting the data relating to a process performed by the semiconductor processing tool from at least one of a physical sensor and a metrology tool physically mounted on the semiconductor processing tool.

3. The method of Claim 1, wherein said inputting comprises indirectly inputting the data relating to a process performed by the semiconductor processing tool from at least one of a manual input device and a database.

4. The method of Claim 3, wherein said indirectly inputting comprises inputting data recorded from a process previously performed by the semiconductor processing tool.

5. The method of Claim 3, wherein said indirectly inputting comprises inputting data set by a simulation operator.

6. The method of Claim 1, wherein said inputting data comprises inputting data relating to at least one of the physical characteristics of the semiconductor processing tool and the semiconductor tool environment.

7. The method of Claim 1, wherein said inputting data comprises inputting data relating to at least one of a characteristic and a result of a process performed by the semiconductor processing tool.

8. The method of Claim 1, wherein said inputting a first principles physical model comprises inputting a spatially resolved model of the geometry of the semiconductor processing tool.

9. The method of Claim 1, wherein said inputting a first principles physical model comprises inputting fundamental equations necessary to perform first principles simulation for a desired simulation result.

10. The method of Claim 1, wherein said performing first principles simulation comprises performing first principles simulation concurrently with the process performed by the semiconductor processing tool.

11. The method of Claim 1, wherein said performing first principles simulation comprises performing first principles simulation independent of the process performed by the semiconductor processing tool.

12. The method of Claim 1, wherein said performing first principles simulation comprises using the input data to set a boundary condition of the first principles simulation model.

13. The method of Claim 1, wherein said performing first principles simulation comprises using the input data to set an initial condition of the first principles simulation model.

14. The method of Claim 1, wherein said using the first principles simulation result comprises using the first principles simulation result to control the process performed by the semiconductor processing tool.

15. The method of Claim 1, further comprising using a network of interconnected resources to perform at least one of the process steps recited in Claim 1.

16. The method of Claim 15, further comprising using code parallelization among interconnected computational resources to share the computational load of the first principles simulation.

17. The method of Claim 15, further comprising sharing simulation information among interconnected resources to control the process performed by the semiconductor processing tool.

18. The method of Claim 17, wherein said sharing simulation information comprises distributing simulation results among the interconnected resources to reduce redundant execution of substantially similar first principles simulations by different resources.

19. The method of Claim 17, wherein said sharing simulation information comprises distributing model changes among the interconnected resources to reduce redundant refinements of first principles simulations by different resources.

20. The method of Claim 15, further comprising using remote resources via a wide area network to control the semiconductor process performed by the semiconductor processing tool.

21. The method of Claim 21, wherein said using remote resources comprises using at least one of remote computational and storage resources via a wide area network to control the semiconductor process performed by the semiconductor processing tool.

22. The method of Claim 1, wherein said performing first principles simulation utilizes at least one of an ANSYS computer code, a FLUENT computer code, a CFRDC-ACE computer code, and a direct simulation Monte Carlo computer code.

23. The method of Claim 1, wherein said using the first principles simulation result to control comprises:

controlling at least one of a material processing system, an etch system, a photoresist spin coating system, a lithography system, a dielectric coating system , a deposition system , a rapid thermal processing system for thermal annealing, and a batch diffusion furnace.

24. The method of Claim 23, wherein said using the first principles simulation result to control comprises:

controlling at least one of a chemical vapor deposition system and a physical vapor deposition system.

25. The method of Claim 1 wherein said inputting data comprises:

inputting at least one of etch rate, deposition rate, etch selectivity, an etch critical dimension, an etch feature anisotropy , a film property, a plasma density, an ion energy, a concentration of a chemical specie, a photoresist mask film thickness, a photoresist pattern dimension.

26. The method of Claim 1, wherein said inputting data comprises:

inputting physical geometric parameters of at least one of a material processing system, an etch system, a photoresist spin coating system, a lithography system, a dielectric coating system , a deposition system , a rapid thermal processing system for thermal annealing, and a batch diffusion furnace.

27. The method of Claim 1, wherein said using the first principles simulation result to control comprises:

controlling the semiconductor processing tool by using empirical model output to adjust said process performed by the semiconductor processing tool.

28. A system comprising:

a semiconductor processing tool configured to perform a process;

an input device configured to input data relating to the process performed by the semiconductor processing tool; and

a first principles simulation processor configured to:

input a first principles physical model relating to the semiconductor processing tool,

perform first principles simulation using the input data and the physical model to provide a first principles simulation result,

using the first principles simulation result to build an empirical model, wherein at least one of said first principles simulation result and said empirical model is selected to control the process performed by the semiconductor processing tool.

29. The system of Claim 28, wherein said input device comprises at least one of a physical sensor and a metrology tool physically mounted on the semiconductor processing tool.

30. The system of Claim 28, wherein said input device comprises at least one of a manual input device and a database.

31. The system of Claim 30, wherein said input device is configured to input data recorded from a process previously performed by the semiconductor processing tool.

32. The system of Claim 30, wherein said input device is configured to input data set by a simulation operator.

33. The system of Claim 28, wherein said input device is configured to input data relating to at least one of the physical characteristics of the semiconductor processing tool and the semiconductor tool environment.

34. The system of Claim 28, wherein said input device is configured to input data relating to at least one of a characteristic and a result of a process performed by the semiconductor processing tool.

35. The system of Claim 28, wherein said processor is configured to input a first principles physical model comprising a spatially resolved model of the geometry of the semiconductor processing tool.

36. The system of Claim 28, wherein said processor is configured to input a first principles physical model comprising fundamental equations necessary to perform first principles simulation for a desired simulation result.

37. The system of Claim 28, wherein said processor is configured to perform said first principles simulation concurrently with the process performed by the semiconductor processing tool.

38. The system of Claim 28, wherein said processor is configured to perform said first principles simulation not concurrently with the process performed by the semiconductor processing tool.

39. The system of Claim 28, wherein said processor is configured to perform said first principles simulation at least by using the input data to set a boundary condition of the first principles simulation model.

40. The system of Claim 28, wherein said processor is configured to perform said first principles simulation at least by using the input data to set an initial condition of the first principles simulation model.

41. The system of Claim 28, wherein said processor is configured to use the first principles simulation result to control the process performed by the semiconductor processing tool.

42. The system of Claim 28, further comprising a network of interconnected resources connected to said processor and configured to assist said processor in performing at least one of the inputting a first principles simulation model and performing a first principles simulation.

43. The system of Claim 42, wherein said network of interconnected resources is configured to use code parallelization with said processor to share the computational load of the first principles simulation.

44. The system of Claim 42, wherein said network of interconnected resources is configured to share simulation information with said processor to facilitate said process performed by the semiconductor processing tool.

45. The system of Claim 44, wherein said network of interconnected resources is configured to distribute simulation results to said processor to reduce redundant execution of substantially similar first principles simulations.

46. The system of Claim 44, wherein said network of interconnected resources is configured to distribute model changes to said processor to reduce redundant refinements of first principles simulations.

47. The system of Claim 42, further comprising remote resources connected to said processor via a wide area network and configured to facilitate the semiconductor process performed by the semiconductor processing tool.

48. The system of Claim 47, wherein said remote resources comprise at least one of a computational and a storage resource.

49. The system of Claim 28, wherein said processor is configured to perform first principles simulation by utilizing at least one of an ANSYS computer code, a FLUENT computer code, a CFRDC-ACE computer code, and a direct simulation Monte Carlo computer code.

50. The system of Claim 28, wherein said processor is configured to use the first principles simulation result to control by controlling at least one of a material processing system, an etch system, a photoresist spin coating system, a lithography system, a dielectric coating system , a deposition system , a rapid thermal processing system for thermal annealing, and a batch diffusion furnace.

51. The system of Claim 50, wherein said processor is configured to use the first principles simulation result to control by controlling at least one of a chemical vapor deposition system and a physical vapor deposition system.

52. The system of Claim 28, wherein said processor is configured to input at least one of etch rate, deposition rate, etch selectivity, an etch critical dimension, an etch feature anisotropy , a film property, a plasma density, an ion energy, a concentration of a chemical specie, a photoresist mask film thickness, a photoresist pattern dimension.

53. The system of Claim 28, wherein said processor is configured to input physical geometric parameters of at least one of a material processing system, an etch system, a photoresist spin coating system, a lithography system, a dielectric coating system , a deposition system , a rapid thermal processing system for thermal annealing, and a batch diffusion furnace.

54. The system of Claim 28, wherein said processor is configured to use the first principles simulation result to control by controlling the semiconductor processing tool by using empirical model output to adjust said process performed by the semiconductor processing tool.

55. A system for facilitating a process performed by a semiconductor processing tool, comprising:

means for inputting data relating to a process performed by the semiconductor processing tool;

means for inputting a first principles physical model relating to the semiconductor processing tool;

means for performing first principles simulation using the input data and the physical model to provide a first principles simulation result;

means for using the first principles simulation result to build an empirical model; and

means for selecting at least one of the first principles simulation result and the empirical model to control the process performed by the semiconductor processing tool.

56. The system of Claim 55, further comprising means for sharing the computational load of the first principles simulation.

57. The system of Claim 55, further comprising means for sharing simulation information among interconnected resources to facilitate a process performed by the semiconductor processing tool.

58. A computer readable medium containing program instructions for execution on a processor, which when executed by the computer system, cause the processor to perform the steps of:

inputting data relating to a process performed by the semiconductor processing tool;

inputting a first principles physical model relating to the semiconductor processing tool;

performing first principles simulation using the input data and the physical model to provide a first principles simulation result;

using the first principles simulation result to build an empirical model; and

selecting at least one of the first principles simulation result and the empirical model to control the process performed by the semiconductor processing tool.